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AIR FORCE HUMAN RESOURCES LABORATORY

AIR FORCE HUMAN RESOURCES LABORATORY
R&D ACCOMPLISHMENTS AND SERVICES FY86 - FY88

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This document provides a brief description of research and development (R&D) accomplishments of the Air Force Human Resources Laboratory and services provided to various customers from fiscal years 1986 to 1988. Some of these accomplishments resulted in interim products and/or capability/feasibility demonstrations which served as building blocks for developing the end products.

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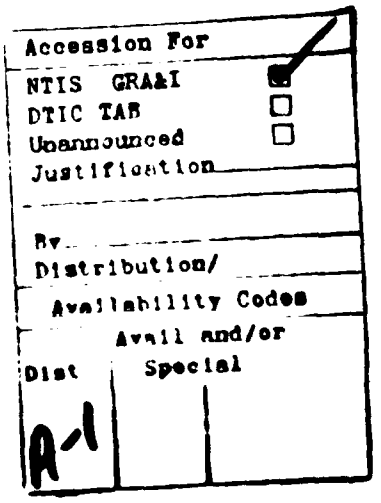
A

PREFACE

This document provides a brief description of research and development (R&D) accomplishments of the Air Force Human Resources Laboratory and services provided to various customers from fiscal years 1986 to 1988. Some of these accomplishments resulted in interim products and/or capability/feasibility demonstrations which served as building blocks for developing the end products. Descriptions of these accomplishments are grouped according to the primary user or organization which generated the R&D requirement. This grouping is rudimentary in that it does not account for the multiple users of the R&D products and services. Appendix A provides an index that relates all products/services to their respective user organizations.



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Combat Maintenance Capability Methodology. This was an initial comprehensive effort to analyze the effect of predicted combat on maintenance while considering the simultaneous impacts of intense flying schedules, increased demands on maintenance, airbase attacks, aircraft attrition and battle damage, and other combat conditions. A scenario was developed, for Hahn AB, Germany, to describe wing operations in wartime. Three modeling techniques (TSAR, TSARINA, and DynaMETRIC) were selected to provide optimal determination of logistics composites, theater airbase resources, and supply demands for wartime operations. This effort provided methodologies to analyze the differences between peacetime and combat aircraft maintenance and the effects of these differences on sortie generation capability. The methodologies developed can be used to better identify training requirements for combat tasks and to realistically assess the potential bottlenecks to sortie generation under combat conditions. The combined results of this effort provide methodologies to realistically assess generation of wartime sorties, identify shortfalls and problem areas, and evaluate possible corrective measures using computer simulation models. (FY86)

CUSTOMERS: HQ USAF/XOOR, HQ USAF/LE-RD

POINT OF CONTACT: Mr. Richard Weimer, AFHRL/LRC, (513) 255-2606, AUTOVON 785-2606

Logistics Command and Control Exercise Program. A demonstration training program was developed to instruct United States Air Forces in Europe (USAFE) personnel on basic logistics operations within the European Theater. It provided an overview of the USAFE and North Atlantic Treaty Organization (NATO) concepts so that personnel would have a better appreciation of the importance of their jobs within the Theater. (FY86)

CUSTOMER: HQ USAF/LGX

POINT OF CONTACT: Mr. Michael Young, AFHRL/LRG, (513) 255-8229, AUTOVON 785-8229

Conference: Validity for 1990s and Beyond. The AFHRL Manpower and Personnel Division, with the support of the Educational Testing Service, sponsored a 3-day conference on test validity and models for validity as extended into the next decade. Distinguished academicians and practitioners presented both theoretical and applied papers. In addition, to demonstrate a point of law as it pertains to selection and classification tests, an actual Federal judge presided over a mock trial patterned after a seminal case involving the County of Los Angeles and Los Angeles firefighters. A hard-cover bound book of the papers and comments on the papers was published by LEA Publishers, Inc. (FY86)

CUSTOMERS: USAF/DPXOA, OASD (FM&MP), HQ USMEPCOM

POINT OF CONTACT: Dr. Malcolm Ree, AFHRL/MOA, (512) 536-3256, AUTOVON 240-3256

Air Force Officer Qualifying Test (AFOQT) Forms P_1 and P_2. Two new parallel versions of the AFOQT (P_1 and P_2) were developed to replace the operational AFOQT, Form O. New forms of the AFOQT are developed periodically to refine the instrument, and to limit possible test compromise. The AFOQT is composed of 16 subtests used to score five composites measuring cognitive abilities deemed relevant to officer success. It is the primary source of aptitude information used to qualify civilian applicants for officer pre-commissioning training through

the Reserve Officer Training Corps (ROTC) and the Officer Training School (OTS). AFOQT results are also used, along with other criteria, in the classification of aircrew members as pilots or navigators. Additional products developed as companion documents to accompany the test booklets were administration manuals, scoring keys, tables for converting examinees' raw scores to percentile equivalents on selection and classification composites, and a test information pamphlet for examinees. (FY87)

CUSTOMERS: HQ USAF/DPXOA, AFMPC/DPMY, ATC/TT

POINT OF CONTACT: Ms. Jacobina Skinner, AFHRL/MOAO, (512) 536-3942, AUTOVON 240-3942

Non-Line Officer Projection Model. The Non-Line Officer Projection Model simulates the personnel activity for each non-line competitive category (e.g., Medical Corps, Judge Advocate General, Chaplain), produces displays of the personnel activities, and projects the non-line officer force structure for at least 10 years into the future. The model includes promotions, augmentations, separations, reduction-in-force board actions, and selective early retirement board actions. A user-friendly routine allows the user to add, delete, and edit data easily and choose among report options. The model is written in SIMSCRIPT II.5 and runs on both mainframe and personal computers. This model is being used by Air Staff and non-line corps manpower and personnel decision makers and planners to evaluate the impact of policy decisions and promotion plans for each non-line officer category. The model was used to help establish the promotion rates for the August 1987 Colonels Promotion Board. (FY87)

CUSTOMERS: HQ USAF/DPXA, HQ USAF/DPXO

POINT OF CONTACT: Maj Timothy Bergquist, AFHRL/MOM, (512) 536-3677, AUTOVON 240-3677

Logistics Managerial Promotion System. Statistical and data processing support was provided during the development of a logistics managerial promotion appraisal system for Air Force civilians. The project was conducted by the Air Force Civilian Personnel Management Center, in behalf of HQ USAF/DPC, with all computer analyses performed by the AFHRL Information Sciences Division. (FY87)

CUSTOMERS: HQ USAF/DPC, AFCPMC/DPCR

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

Logistics and Human Factors/Training Analysis of Future Gunships. This effort developed and demonstrated methodology to quantify the sortie generation capability and maintenance manpower requirements for a hypothetical but representative state-of-the-art gunship. This work demonstrated for the first time that quantitatively oriented front-end logistics analyses during a system's conceptual design phase can reduce weapon system life-cycle costs and increase supportability, improving overall war-fighting capability. Emphasis was on quantification of selected resources for a specific weapon system design and specified missions and scenarios. The intent was to provide a baseline comparison system and to accumulate preliminary data for a replacement gunship. Findings from these efforts have been incorporated into the Requests for Proposals (RFPs). (FY87)

CUSTOMERS: HQ USAF/XOO, HQ USAF/RDQ, ASD

POINT OF CONTACT: Capt Douglas Popken, AFHRL/LRL, (513) 255-8418, AUTOVON 785-8418

Small Unit Maintenance Manpower Analyses (SUMMA). The SUMMA program developed technology that provides a computer-based decision support system (computer model) useful for: projecting and analyzing combat workloads based on deployment scenarios; allocating maintenance tasks to new or redefined job specialties; evaluating, through integration of logistics performance simulation and force management/policy analysis, the combat effectiveness and feasibility of desired job restructuring. The SUMMA decision support system can be used by analysts working in system program offices to help in the definition and redefinition of maintenance occupations for new weapon systems. For managers in the manpower, personnel, and training arenas, SUMMA allows a more complete analysis of proposed changes in occupational structures and the capability to judge the probable contribution of restructured maintenance specialties to combat success. (FY87)

CUSTOMERS: HQ USAF/LE, ASD, TAC, SAC, MAC

POINT OF CONTACT: Mr. Edward Boyle, AFHRL/LRL, (513) 255-8418, AUTOVON 785-8418

Multi-Test Appropriateness Indices. Multi-test appropriateness indices can be used to detect individuals inadequately or inappropriately measured by the Armed Services Vocational Aptitude Battery (ASVAB). Cheating to obtain higher scores or malingering (e.g., purposely getting low scores under a nationwide mobilization) are important instances of inappropriate test responses. Implementation of these indices (in place of an established measure of deliberate failure) is being considered at HQ USAF/DPX. (Exploratory work completed FY87)

CUSTOMERS: HQ USAF/DPXOA, OASD (FM&MP), HQ USMEPCOM, CNO, HQ USA, HQ USMC

POINT OF CONTACT: Mr. James Earles, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

ASVAB Forms 15, 16, 17. The ASVAB is used as the primary enlisted selection and classification test for the United States Armed Services. AFHRL is the lead organization for conducting the R&D necessary to support joint-Service and Department of Defense (DOD) programs. Raw scores on ASVAB Forms 15, 16, and 17 were converted to standard scores for all the Services' selection and classification composites. These conversions are being evaluated using operational scores from applicants. (Completed in FY87, implemented in FY88)

CUSTOMERS: HQ USAF/DPXOA, USMEPCOM

POINT OF CONTACT: Dr. Linda Curran, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

ASVAB Forms 18, 19. ASVAB tests were constructed for use in high schools as part of the DOD Student Testing Program. Raw scores on these forms were converted to the score metric used by school counselors and also to the operational scores used by each Service for selection and classification. (Completed FY88)

CUSTOMERS: HQ USAF/DPXOA, USMEPCOM

POINT OF CONTACT: Mr. James Earles, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

High School Equity: Item Level Approaches. The eight nonspeeded subtests of the ASVAB used in the DOD Student Testing Program were examined for differential item functioning. Twenty-seven different indices were calculated for each of the 200 items on the eight subtests for comparisons

of item functioning for White and Black examinees, White and Hispanic examinees, and male and female examinees. Relatively few items were consistently identified as functioning differently for any of the comparison groups. (Completed first study FY88)

CUSTOMERS: HQ USAF/DPXOA, USMEPCOM

POINT OF CONTACT: Dr. Linda Curran, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

ASVAB Civilian Occupational Validation. The ASVAB is used in over 14,000 high schools each year and 1.3 million high school students are tested annually throughout the nation as part of the DOD Student Testing Program. High school counselors and students use ASVAB scores for career exploration and the joint-Service recruiters use the ASVAB scores as "leads" for potential applicants for their respective Services. In order to make the ASVAB as useful to counselors and students as possible, the relationship between scores on the ASVAB and success in civilian occupations has to be demonstrated. Until recently, however, validity data on the ASVAB have derived primarily from military training success criteria. To provide validity data appropriate for the high school testing program, a preliminary ASVAB civilian validation study was conducted using "holding a job in one of 12 occupations for at least 3 months" as the criterion. A follow-on study using job performance criteria is planned. (First study completed FY88; second effort is underway)

CUSTOMERS: HQ USAF/DPXOA, HQ ATC, ATC/RS, AFMPC, OASD (FM&MP) (MM&P) (AP)
Ultimate users will be counselors in the high schools throughout the United States

POINT OF CONTACT: Dr. Thomas Watson, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

Armed Forces Qualification Test (AFQT). The Office of the Assistant Secretary of Defense (OASD) (FM&MP) requested a new test composite to replace the AFQT. Through the use of regression analyses and cross-tabulations, a new AFQT composite was developed and accepted by the OASD for use in all American military qualification testing. (FY88)

CUSTOMERS: USAF/DPXOA, OASD (FM&MP), HQ USMEPCOM, CNO, HQ USA, HQ USMC

POINT OF CONTACT: Dr. Malcolm Ree, AFHRL/MOA, (512) 536-3256, AUTOVON 240-3256

Math Techniques for Symmetric Regressions Smoothed Test Equatings. Past equatings of new ASVAB forms have always been unidirectional; i.e., from the new forms to the reference form. Mathematical procedures have been applied to make resultant equatings symmetric, such that the equating is indifferent to whether the new forms are equated to the reference or vice-versa. (FY88)

CUSTOMERS: HQ USAF/DPXOA, USMEPCOM

POINT OF CONTACT: Mr. James Earles, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

Accession/Retention Model. AFHRL accession/retention R&D has encompassed three different efforts to gain insight into the impact of economic factors in this area. The results of an analysis of the retention of airmen in various Air Force specialties were used to develop the Air Force Reenlistment Analysis Package (AFRAP). AFRAP allows changes to be made in bonuses, relative

wages, and demographic factors, and predicts the effects these changes would have on the retention of airmen. The other two personnel market studies were the Joint Accession/Retention Study, which looked at how accession and retention are jointly determined, and the Civilian Availability Study, which estimated the number and skills of civilians needed by the Air Force. (FY88)

CUSTOMERS: HQ USAF/DPXA, OASD(FM&MP)

POINT OF CONTACT: Mr. Larry T. Looper, AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

Personnel Data Bases for HQ USAF/DP and RAND Corporation. Annual updates were provided from several historical enlisted personnel data bases to the Directorate of Personnel Plans, Analysis Division (HQ USAF/DPXA) to support their work with the RAND Corporation on the Enlisted Force Management Project. Master file data were derived from the Processing and Classification of Enlistees file, the Airman Reenlistment and Loss file, and an automated file of data elements and code definitions for the time period. (FY88)

CUSTOMERS: HQ USAF/DPXA, HQ AFMPC/DPMDW, RAND Corporation

POINT OF CONTACT: Mr. Jim Brazel, AFHRL/SCYJ, (512) 536-2146, AUTOVON 240-2146

Enlisted Force Accession and Attrition Analysis. Annual reports on enlisted personnel were provided to HQ USAF/DPXA. These reports contained data on all individuals who enlisted in the Air Force during the previous 10 years, and reflected losses, re-enlistments and extensions during that time. Eight demographic variables were used as a means of tracking enlisted retention by cohort year group. The reports related enlisted retention (re-enlistment and extension) to planned personnel program objectives and analyzed the retention of cohort year groups on the basis of these demographic attributes. (FY88)

CUSTOMER: HQ USAF/DPXA

POINT OF CONTACT: Mr. Dick Rogers, AFHRL/SCY, (512) 536-3928, AUTOVON 240-3928

Historical Data Base of Officer Personnel. A data base containing information on Air Force officers on active duty at any time from 1960-1987 was constructed from R&D master files maintained by the AFHRL Information Sciences Division. The data base is organized to facilitate the study of trends within the officer force and the impact of a variety of personnel program initiatives. The data base supports analyses conducted at HQ USAF/DPXA. A file of identity and name changes and a file containing meanings of data codes accompanied the officer data base. Data on 430,000 officers are included in the data base. (FY88)

CUSTOMER: HQ USAF/DPXA

POINT OF CONTACT: Mr. Dick Rogers, AFHRL/SCY, (512) 536-3928, AUTOVON 240-3928

Study of Officer Test Performance by Race. This project provided demographic data and descriptive statistics of Air Force Officer Qualifying Test (AFOQT) performance for ethnic subgroups composed of Caucasian, Black, and Hispanic subjects. Sample groups included (a) all AFOQT examinees (1 Jan 83 - 31 Dec 86), (b) all who submitted an application, and (c) all

applicants who were selected. The average percentage of applicants selected was 48%, with some variations among ethnic groups. (FY88)

CUSTOMER: HQ USAF/DPPE

POINT OF CONTACT: Ms. Linda Elliott, AFHRL/MOAO, (512) 536-3942, AUTOVON 240-3942

AIR FORCE MILITARY PERSONNEL CENTER

Attrition Trends and Technical Training. Quarterly and annual reports on graduation/elimination rates were produced from data on Air Force enlisted technical training courses. The reports were supplemented with aptitude and demographic data broken down by race, sex, education, mental category, and enlistment category. The reports were provided in conjunction with a Memorandum of Agreement with the Air Force Military Personnel Center. (FY86-continuing)

CUSTOMERS: AFMPC/DPMR, HQ ATC/TTPR, HQ ATC/TTOK

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

Reevaluation of the Weighted Airman Promotion System (WAPS). The basic research methodology used in the development of WAPS is known as "policy capturing." It consists of mathematically duplicating or capturing the rankings assigned to a sample of airmen by members of an experimental promotion policy board. Since the promotion policy of experts may change significantly over time, it is necessary to periodically reevaluate the model to ensure that WAPS is consistent with current Air Force management policies while remaining both visible and equitable. Candidate promotion systems were developed that show the direction of change indicated by the expert raters. The impact of these systems on women and minorities was determined. The results of this R&D have provided Air Force enlisted promotion policymakers with a current, scientifically defensible basis for making improvements to WAPS. This, in turn, will ensure that the best and most deserving enlisted personnel are selected for promotion to the important mid-level grades and will impact positively on retention rates, quality of performance, and morale. (FY86)

CUSTOMERS: AFMPC/DPMA, HQ USAF/DPXO

POINT OF CONTACT: Mr. Walter Albert, AFHRL/MODM, (512) 536-3677, AUTOVON 240-3677

Health Professions Scholarship Program (HPSP) Model. An increase in the ratio of applicants per scholarship from one to three provided a reason to assess the selection procedures used in awarding HPSP scholarships. A preliminary investigation revealed that cutoff scores for scholarships tended to rise during the selection process. To help maintain a constant cutoff score, a selection model was developed using the policy-specifying methodology. The model provides a check to ensure that cutoff scores remain constant, and by including variables that the selection board does not formally address, it gives alternative scores which can be rank ordered. The rankings can be used to screen applicants to meet the selection board, to flag applications that the board might need to review again, to serve as a tie breaker, or to function as an additional board member. The model's score forms the basis for a longitudinal data base to track the progress of scholarship recipients through training and through their Air Force careers. The selection model is being used to assist AFMPC/SG in AFHPSP selection procedures. (FY86)

CUSTOMER: AFMPC/SGY

POINT OF CONTACT: Lt John McGarrity, AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

English Language Tests for Foreign Nationals. Basic and intermediate versions of the English Language Tests (ELTs) have been used since 1965 to assess the proficiency of foreign nationals applying for employment at overseas bases. The ELTs were revised to update the content and to refine the tests' value for identifying job applicants with a marginal or superior command of English as a second language. Four language components were assessed: listening, reading, speaking, and writing. Parallel forms of both the basic and intermediate-level tests were constructed and validated. The ELTs were field tested with foreign nationals employed at Howard AFB, Panama. Their scores were shown to correlate significantly with supervisory ratings of ability to use English on the job. The revised ELTs are now being used operationally by civilian personnel offices at overseas locations. (FY87)

CUSTOMER: AFMPC/DPCR

POINT OF CONTACT: Ms. Jacobina Skinner, AFHRL/MOAO, (512) 536-3942, AUTOVON 240-3942

Information Pamphlet for the Air Force Officer Qualifying Test (AFOQT). Individuals interested in applying for commissioning programs are required, as part of the officer selection process, to take the AFOQT and demonstrate proficiency in aptitude, knowledge, and ability areas required for officer jobs. A pamphlet was developed to familiarize prospective test-takers with the nature and purpose of the test. Information pertinent to test format, schedule, and content, including sample questions and answers, was provided. Recruiters and test examiners maintain a supply of the pamphlets and provide a copy to each of the approximately 35,000 applicants scheduled for testing annually. (FY87)

CUSTOMER: AFMPC/DPMYOT

POINT OF CONTACT: Lt Tony Smith, AFHRL/MOAO, (512) 536-3845, AUTOVON 240-3845

Decision Models. This stream of research has resulted in several quantitative tools to aid Air Force manpower and personnel decision makers. Much of the work has been performed in response to needs identified by the using personnel community. Recent examples of this are the career flow model of the non-line officer force, the decision modeling work to support the selection of the best candidates to receive health professions scholarships, and the enhancement of the Laboratory's decision modeling capability. This research most often entails application to personnel problems, but it has also resulted in the development of new techniques in mathematical optimization, simulation, and decision analysis. R&D in decision analysis has supported work in enlisted promotion, person-job match, and weapon system effectiveness. Finally, it has resulted in the development of an Integrated Decision Modeling System software package that incorporates four widely used decision analysis tools into one system to assist the user in the selection and application of the proper decision analysis technique. (FY87)

CUSTOMERS: AFMPC/DPMY, HQ USAF/DPXA

POINT OF CONTACT: Mr. Larry T. Looper, AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

Retraining Person-Job Match (PJM). At various times, the Air Force will have more personnel than needed in some Air Force specialties (AFSs) and fewer personnel than needed in others. In order to balance AFSs, AFMPC must identify which personnel should be reclassified and retrained. The number of individuals that can be reclassified is usually much greater than the number of positions available. The Air Force addresses this problem by allowing personnel to volunteer for

retraining and reclassification. If the number of volunteers is too small, the Air Force identifies personnel who must retrain to specific AFSs. The present system classifies personnel on a "first-come, first-served" basis. Although automated, the present system does not take advantage of available classification technology to optimally select and reclassify personnel. AFHRL is developing two models to assist AFMPC in the selection and reclassification of personnel. The first model addresses the nonvolunteer retrainee. In the nonvolunteer model, once the personnel to be considered for reclassification have been identified (along with their AFSs) and the number of required retrainees has been determined, the model uses mathematical programming techniques to optimally assign personnel to retraining AFSs. The assignment is based on a predefined payoff algorithm which defines a person's "value" in terms of possible retraining AFSs. The nonvolunteer model has been completed and implemented by AFMPC. The volunteer model is currently being developed. (FY88)

CUSTOMER: AFMPC/DPMRQ4

POINT OF CONTACT: Capt Mark Emerson, AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

AIR TRAINING COMMAND

Air Force Specialties (AFSs) Study. Specialized computer programs maintained by the Information Sciences Division were used to analyze the frequency and criticality of work performed in a variety of Air Force specialties. The data were collected by the USAF Occupational Measurement Center (ATC), and provided the basis for changes to the curricula in technical training courses. Seventy-eight (78) specialties have been analyzed. (FY86-continuing)

CUSTOMER: USAFOMC

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

ASCII CODAP. The Comprehensive Occupational Data Analysis Programs (CODAP) is the principal occupational data analysis software system used by the Air Force. The CODAP ASCII system consists of a package of computer programs used to input, process, organize, and report occupational data from job inventories. The current AFHRL package has the capability of processing 20,000 cases, 3,000 task ratings per case, and 2,000 items of background information. Hierarchical clustering can be performed on up to 7,000 cases. Current work is concentrating on adding advanced task and job clustering capabilities and other research technologies called for by AFHRL Manpower, Personnel, and Training (MPT) integration R&D. New capabilities include enhancements to existing programs and expanded capabilities in the areas of profile analysis, multidimensional scaling, regression analysis, and factor analysis. The other branches of the US military services, as well as the British, Canadian, West German, and Australian Armed Forces, have incorporated CODAP into their operational occupational measurement programs. (FY86)

CUSTOMERS: USAFOMC, AFHRL, Army, Navy, Allied Military Services

POINT OF CONTACT: Mr. William Phalen, AFHRL/MODM, (512) 536-3677, AUTOVON 240-3677

Officer Training School (OTS) Graduate versus Nonmedical Eliminee Profiles. USAF Recruiting Service requested descriptive profiles for OTS graduates, nonmedical eliminees, and self-initiated eliminees. Data regarding applicant characteristics were collected for each group. Characteristics included: measures of academic ability (type of degree--BS/BA/MS/MA/PhD, grade point average, completion of calculus courses, and Air Force Officer Qualifying Test (AFOQT) scores); indicators of general suitability (recruiter evaluations, letters of recommendation); occupational specialty; and demographic information (race, sex, age, prior military service). Graduates tended to have higher AFOQT scores and higher grade point averages than did nonmedical eliminees. The profiles of graduates and self-initiated eliminees did not differ. The profile analysis indicates that recruiters should consider, in addition to indicators of academic ability, other applicant characteristics, such as value orientation, motivation, and expectations, in order to reduce the number of self-initiated eliminees. (FY86)

CUSTOMER: USAFRS

POINT OF CONTACT: Ms. Linda Elliott, AFHRL/MOAO, (512) 536-3942, AUTOVON 240-3942

Portable Basic Attributes Tests System (Porta-BAT). Using computer technology and a battery of tests, the Porta-BAT system measures a person's hand-eye coordination, information processing capabilities, and personality characteristics. To be able to administer these tests reliably at any location, without highly trained administrators, a self-contained, auto-administering computer test system, the Porta-BAT, was developed. The test results provide input for pilot selection and classification research. (FY86)

CUSTOMERS: HQ ATC, USAFRS, Air National Guard, Royal Australian Air Force, US Army, US Air Force Academy, EURO-NATO Aircrew Selection Working Group

POINT OF CONTACT: Maj Dave Perry, AFHRL/MOEA, (512) 536-3222, AUTOVON 240-3222

Pilot Candidate Selection Method (PCSM). The PCSM uses scores from the Porta-BAT and the AFOQT, biographical information, and grades from the Flight Screening Program (FSP). These pieces of information are combined by PCSM and a final score produced for the candidate which reflects his/her chances of completing pilot training. The Air National Guard began using the PCSM in FY86, and ATC began partial implementation in FY87 for Officer Training School Pilot Selection. (FY87)

CUSTOMERS: HQ ATC, HQ ANG

POINT OF CONTACT: Maj Dave Perry, AFHRL/MOEA, (512) 536-3222, AUTOVON 240-3222

Orbital Mechanics Tutor. This system was developed to provide an environment for students to discover principles of ground traces as a direct function of the orbital elements. The system was designed to teach students how to "deduce" a satellite's orbital elements by looking at a graphic display of a satellite's ground trace. The system also teaches students how to use more systematic behaviors to explore this domain. Since the system is equipped with a number of on-line tools that were specially designed to help students better understand facts, principles, and relationships, the student is free to investigate different options and learn at his/her own pace. If, however, the student fails to make satisfactory progress, then the system intervenes and directs the student toward specific goals. (FY87)

CUSTOMER: ATC/STS

POINT OF CONTACT: Dr. Wes Regian, AFHRL/IDI, (512) 536-2981, AUTOVON 240-2981

Procurement Management Information System (PROMIS) Enhancements. Since 1986, AFHRL has made significant advances in applying person-job-match (PJM) technology to the job classification area. Through PROMIS, managed by the Air Force Recruiting Service, all enlistees are classified into either a specific Air Force specialty or one of four general job areas (mechanical, administrative, general, or electronics). Enhancements to the PROMIS PJM algorithm include: (a) the addition of Vocational Interests for Career Enhancement (VCICE) scores, thus providing more data on the recruit's job preferences; and (b) the use of all 10 ASVAB subtest scores as predictors of technical school success, a surrogate measure for job performance. Both enhancements are awaiting approval for operational implementation. (FY88)

CUSTOMERS: USAFRS, ATC/XP, AFMPC/DPMR

POINT OF CONTACT: Dr. Manuel Pina, Jr., AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

Processing and Classification of Enlistees (PACE) Classification System. The PACE system is used at Lackland AFB to track and manage the thousands of non-prior service enlisted personnel who flow through Basic Military Training each year. A major subsystem of PACE classifies basic trainees into specific career fields on a weekly basis. An improved classification algorithm for PACE is nearing completion. The algorithm is a mathematical model of expert judgments about how recruits with differing qualifications can be assigned to specialties to maximize the overall benefit to the Air Force. It takes advantage of technology developments in the areas of personnel research (ASVAB, job analysis), decision modeling, and advances in computer hardware. The new PACE algorithm is currently being tested by ATC/TT in parallel with the present classification system. (FY88)

CUSTOMER: ATC/TT

POINT OF CONTACT: Dr. Manuel Pina, Jr., AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

Selection and Classification Porta-BAT Data Base. The test base for the Porta-BAT was expanded to 35 tests, and 8 were validated against Undergraduate Pilot Training (UPT) pass/fail or the Advanced Training Recommendation Board decision. Two models, one for selection and one for classification, were developed and transitioned to the Human Systems Division to provide a baseline for an updated Porta-BAT model being acquired as part of a Pilot Selection and Classification System (PSACS). AFHRL plans to expand the data base to include more operational unit test results. Plans are for ATC to incorporate these selection and classification models into PSACS in 1991 for selecting and classifing Air Force pilots for the Specialized Undergraduate Pilot Training program. (FY88)

CUSTOMERS: HSD/YA, HQ ATC, Air National Guard, Royal Australian Air Force, US Air Force Academy, EURO-NATO Aircrew Selection Working Group

POINT OF CONTACT: Maj Dave Perry, AFHRL/MOEA, (512) 536-3222, AUTOVON 240-3222

Validation of the Air Force Officer Training School (OTS) and Reserve Officer Training Corps (ROTC) Selection Systems. The selection systems for OTS and ROTC candidates were examined. Selection into ROTC is based on an overall Quality Index Score (QIS), based on a weighted combination of five measures of academic ability and a rating of overall acceptability provided by the detachment commander. Selection into OTS is based on minimum qualifications and overall assessment by OTS selection boards, who are advised to consider applicant characteristics such as academic ability, leadership potential, and overall suitability for a military officer role. Applicant characteristics most highly related to OTS selection were identified and examined for relation to eight measures of performance in training and on the job. ROTC QIS scores were validated using the same eight criteria. Experimental performance appraisal forms were developed and administered to the supervisors of 3,000 OTS and ROTC graduates. Supervising officers were informed that the appraisal forms were for research purposes only, in order to facilitate a more critical appraisal. Subjects were rated on specific abilities, overall job performance, motivation, and potential for career progression. (FY88)

CUSTOMER: ATC

POINT OF CONTACT: Ms. Linda Elliott, AFHRL/MOAO, (512) 536-3942, AUTOVON 240-3942

Job Performance Measurement System (JPMS). Job performance measurement instruments were developed in response to requests from ATC and AFMPC and a Congressional mandate that the Services establish valid linkages among job performance, enlistment standards, and training outcomes. The JPMS incorporates a variety of different types of instruments for measuring job performance, including hands-on measures, interview techniques, written tests, and rating forms. Under the Joint-Services Job Performance Measurement Project, the performance measurement technology is used to collect valid, accurate information about the performance of first-term airmen in career fields that represent the major aptitude areas of the Armed Services Vocational Aptitude Battery. Measurement instruments have been developed and data collected for eight Air Force enlisted specialties. The job performance measurement technology and information collected are being assessed for their usefulness in evaluating training programs. (FY88)

CUSTOMERS: HQ ATC, AFMPC, MAJCOMs

POINT OF CONTACT: Capt Martin Pellum, AFHRL/IDE, (512) 536-2932, AUTOVON 240-2932

Training Decisions System (TDS) Task Clustering Methodology. The task clustering methodology developed for the TDS project was compared to the task clustering methodology used by the USAF Occupational Measurement Center (USAFOMC/OMT) in their training development process. The results of the study showed that the TDS methodology produced very similar clusters in a much shorter time period. The study concluded that the new TDS clustering technology has potential applications for the Air Force's training development process. (FY88)

CUSTOMER: USAFOMC

POINT OF CONTACT: Mr. Winston Bennett, AFHRL/IDE, (512) 536-3047, AUTOVON 240-3047

Training Decisions System (TDS) Demonstrator. The TDS Demonstrator is an interim microcomputer-based system designed to provide demonstrations and user evaluations of the TDS. The goal of the TDS is to provide training policymakers with advanced modeling capabilities to aid in developing optimal, overall training designs for enlisted Air Force career ladders. The TDS Demonstrator provides potential TDS users with an opportunity to view typical TDS products. The TDS Demonstrator uses a combination of actual and simulated data to clarify the advantages that can be accrued from being able to answer "what if" training questions. The menu-driven features used throughout the TDS Demonstrator allow a manager with little or no computer background to see how the TDS would help develop cost-effective training alternatives which consider information about job tasks, assignment patterns, and managers' preferences. (FY88)

CUSTOMERS: ATC, HQ USAF

POINT OF CONTACT: Mr. Winston Bennett, AFHRL/IDE, (512) 536-3047, AUTOVON 240-3047

Maintainer's Associate Training Instructional Environment (MATIE I/II). A previously developed expert system (MATIE I) was enhanced to permit the development of an Intelligent Tutoring System (ITS) based upon the maintenance knowledge domain. The objective of MATIE II has been to implement and demonstrate an intelligent system based upon the ITS framework from MATIE I without the specific maintenance knowledge. A subobjective was to design a basic architecture called the Associate Training Instructional Environment (ATIE) which allows for the rapid development of an ITS for many domains. (FY88)

CUSTOMERS: ATC/XPC, Lowry Technical Training Center

POINT OF CONTACT: Capt Kevin Kline, AFHRL/IDI, (512) 536-2981, AUTOVON 240-2981

Challenger. The overall objective of this effort was to develop a prototype Intelligent Tutoring System (ITS) in the domain of Orbital Dynamics. The prototype is executable on a Xerox 1108/1186 workstation. Five detailed objectives for the Phase 1 effort were: (a) determine the academic characteristics that make a training domain suitable for ITS applications; (b) develop an intelligent and powerful human-computer interface; (c) develop a model of domain expertise for the prototype; (d) develop an effective tutorial module to guide individualized training processes; and (e) develop a demonstrable ITS prototype in the field of Orbital Dynamics as taught by the United States Air Force Academy (USAFA). The prototype teaches about 25 hours of the curriculum for Block I of Orbital Mechanics. A second-generation system, currently in the planning stage, will extend the system to teach the entire Block I Orbital Dynamics curriculum and add authoring tools to allow ITS development by on-site training development personnel. (FY88)

CUSTOMERS: ATC/XPC, ATC/STS, USAFA

POINT OF CONTACT: Maj James Parlett, AFHRL/IDI, (512) 536-2981, AUTOVON 240-2981

Technical Training Impact Model (TTIM). TTIM is a user-friendly, multivariate, portable computer model and data base for forecasting the impact of changes in aptitude requirements on formal technical school requirements and outcomes. Any combination of 31 student characteristics, course content, training performance, and course cost variables may be modified to evaluate the impact on training performance or cost. The model will permit personnel and training planners to jointly evaluate the integrated effects of changes in student input or training course variables. Such integrated planning is essential during tradeoff analysis by training planning teams during the weapon system acquisition process or for existing systems. Several potential users are currently evaluating TTIM. (FY88)

CUSTOMERS: ATC/XPR, AFMPC, ASD/ALH

POINT OF CONTACT: Dr. R. Bruce Gould, AFHRL/MODS, (512) 536-3648, AUTOVON 240-3648

Fiber-Optic Helmet-Mounted Display (FOHMD). The FOHMD provides a significant breakthrough in display technology. A prototype version has been developed which projects the visual scene from "light valves" directly into the eyes of the pilot through lenses mounted on the helmet. Images are synchronized by tracking the position of the pilot's head and eyes. The FOHMD provides an affordable color, high-brightness, high-resolution, and wide-field-of-view display required for advanced tactical air-to-air and air-to-ground training. The performance of the FOHMD provides a previously unavailable capability to train in a full-field-of-view flight simulator. Unlike conventional displays, this system can take advantage of the level-of-detail of state-of-the-art image generators, while providing luminance levels brighter than those of other display devices. (FY86)

CUSTOMERS: ASD, TAC

POINT OF CONTACT: Mr. Melvin Thomas, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Ground-Launched Cruise Missile (GLCM) Redesign. A demonstration of the value of on-line reliability and maintainability analysis using computer-aided design (CAD) was achieved through redesign of the turbine power generator (MEP-404B) on the GLCM Unique Turbine System (GUTS). Field-reported Mean Time Between Failure (MTBF) was less than 25 hours, due, in part, to the buildup of excess heat. Availability of the weapon system was further reduced due to maintainability problems for this generator. To address these problems, the GLCM Program Office redesigned the MEP-404. The AFHRL Logistics and Human Factors Division (AFHRL/LR) joined this redesign effort through the use of CAD to ensure that the repackaging of the GUTS allowed required ventilation (to improve reliability) and that all major components could be easily accessed (to improve maintainability). Twenty-one (21) of AFHRL's 28 design recommendations were accepted and incorporated into the hardware. These recommendations increased the estimated availability of the turbine systems by 4% to 8%, and improved estimated repair elapsed times by 25% to 50%. (FY86)

CUSTOMER: ASD

POINT OF CONTACT: Mr. Alan Herner, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Computer-Based Maintenance Aids System (CMAS). A prototype CMAS was developed and evaluated to demonstrate the capability of electronic technical order systems to store, retrieve, and present information for technicians performing maintenance tasks at the intermediate (shop) level. Two draft specifications were developed identifying the specific categories of information to be included, the actual content of each category, the formats in which to present the data, and the data relationships (e.g., branching instructions) for the data. The second specification defines the functional requirements such as response times, data base management, graphics presentation, and man/machine interface techniques. These data are being incorporated in a fully developed field demonstration system that will support fully automated technical order systems. (FY86)

CUSTOMERS: ASD, MAJCOMs

POINT OF CONTACT: Mr. David Gunning, AFHRL/LRC, (513) 255-2606, AUTOVON 785-2606

Milstar Mission Control Study. In 1987, manning shortfalls were anticipated in the Space Systems Officer specialty (AFSC 2055) responsible for Milstar communications satellite ground control and operations. Managers at Headquarters Space Division requested assistance in compiling data relevant to evaluating the feasibility of training and assigning less-experienced officers from other Space Operations specialties and from the Engineer career field. Information pertinent to an assessment of the skills, experience, and performance of officers in the different specialties was solicited. AFHRL contributed aptitude and ability data derived from the Air Force Officer Qualifying Test. Comparisons were conducted of verbal, quantitative, and academic aptitude measures for officers in several specialties of interest to Space Division. (FY87)

CUSTOMER: SD/CWAM

POINT OF CONTACT: Mr. Todd Sperl, AFHRL/MOAO, (512) 536-3845, AUTOVON 240-3845

Advanced On-the-job Training System (AOTS) Cost Model. AOTS is a prototype state-of-the-art training system that integrates, effectively manages, evaluates, and automates job site training. The prototype will be tested in operational workcenters at Bergstrom AFB and Ellington ANGB from 1 Aug 88 to 31 Jul 89. A cost model has been developed that is designed to estimate the cost of implementing and operating AOTS in the Air Force. The model includes cost estimates for hardware, software (Ada) development and maintenance, and courseware development and maintenance. This model can provide cost estimates by Air Force specialty (AFS), by major command (MAJCOM), as well as for the total Air Force. (FY87)

CUSTOMER: HSD/AC

POINT OF CONTACT: Maj Jack Blackhurst, AFHRL/ID/OL-AK, (512) 479-2669, AUTOVON 685-2669

Effects of Resolution on Target Detection and Identification. The effects of two levels of visual system resolution on target detection and identification were investigated using the Fiber-Optic Helmet-Mounted Display (FOHMD) both with and without the high-resolution inset operating. The targets consisted of six different representative ground targets (i.e., tanks, trucks, missiles, etc.) viewed from three different orientations. The results indicated enhanced performance on both tasks for all targets with the use of the high-resolution inset; however, the ranges obtained even with the high-resolution inset were less than would be desired for performing these tasks in a training mode. (FY87)

CUSTOMERS: ASD, TAC

POINT OF CONTACT: Dr. Elizabeth Martin, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

F-15E Turnaround and Reconfiguration Study (TARS). With the planned European deployment of the F-15E in protective (TAB-VEE) shelters, concern was expressed regarding potential physical clearance problems associated with aircraft turnaround and reconfiguration. To address these concerns, the F-15 System Program Office (SPO) and AFHRL/LR developed a joint program to use graphical analysis on a computer-aided design (CAD) workstation. The purpose of this effort was: (a) to define and develop solutions to potential problems relative to the turnaround and reconfiguration of the F-15E prior to its deployment in Europe, and (b) to demonstrate the utility and benefits of CAD tools for performing supportability analysis. A demonstration of a simulated turnaround of an F-15E configured for an air-to-air mission identified several problem

areas. Results of these analyses were transitioned to the SPO and the prime contractor for the F-15E, for inclusion in the appropriate technical manuals. (FY87)

CUSTOMER: ASD

POINT OF CONTACT: Mr. Alan Herner, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Analysis of Flight Simulator Transport Delay Effects. As aircraft simulators become increasingly complex and expensive, their ability to provide realistic training becomes an ever-growing concern. Simulators for the tactical fighter have been plagued by the inability of the simulation to faithfully reproduce in real time the fighter aircraft's response to pilot input. This analysis investigated transport delay effects to determine the maximum acceptable time delay with respect to flying qualities. Experiments were conducted with the NT-33 (a modified T-33) with analog and digital computers on board that simulated various aircraft/mission combinations. Tentative results indicated that 150 milliseconds is the maximum transport delay that can be tolerated, with a simulator-added delay of less than 50 milliseconds. These data apply to small-field-of-view simulators. A follow-on study is planned which will incorporate an expanded field of view. (FY87)

CUSTOMER: ASD/YW

POINT OF CONTACT: Capt Pete Lasch, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Object Density Requirements for Low-Level Flight. A study was conducted in which the effects of familiar objects and object density on altitude judgment and control were investigated. The study compared four density levels and three object-type conditions. The results indicated that altitude judgment was enhanced with higher density levels but was not affected by object type. A follow-on study is underway in which the display luminance is enhanced and the tasks slightly modified. (FY87)

CUSTOMER: ASD

POINT OF CONTACT: Dr. Elizabeth Martin, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

High-Resolution Optimization Study--Phase I. Simulated Synthetic Aperture Radar (SAR) images generated from four levels of data base density were used by 25 B-1B Offensive Systems Officers to perform a navigation update task. Task performance for a high-density data base (Level X) was no better than for a lower-density data base (Defense Mapping Agency Level 2 Digital Feature Analysis Data) that was computer enhanced to more closely resemble SAR. (FY87)

CUSTOMERS: ASD/ENETV, ASD/YWB, DMAAC/PR, SAC/DOT, SAC/XP

POINT OF CONTACT: Dr. Peter Crane, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Transformation Accuracy Requirements for Real Beam Radar. Digital terrain elevation data were transformed into a model of the earth's surface by fitting polygons to the elevation posts. The model was then used to generate radar simulations. The accuracy of this transformation affects transformation time, storage requirements, and image quality. In two experiments, it was determined that navigators were unable to distinguish between simulations produced from the current standard and those resulting from transformations that are more accurate than the current standard. (FY87)

CUSTOMER: ASD/ENETV

POINT OF CONTACT: Dr. Peter Crane, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Instructor-Operator Station (IOS) Design Guidelines. The initial effort under this task was a review of current research and field experience to assess the utility of existing instructional features for conversion and continuation training as taught by each of the operational commands, MAC, SAC, TAC, and ATC. Navy and Army data were added as applicable. This compilation of data was reduced and organized in a matrix of instructional features by applications, with command differences noted to allow designers to select the most appropriate features for each operational simulator. A portion of this effort was the derivation of a standard engineering definition for each instructional feature. A concurrent effort is the development of a guide for the design of IOSs for simulators. This guide was written to define the general characteristics of IOS layouts for both single and multiple instructor configurations. Guidance for the standardization of the format for cathode-ray tube (CRT) pages and the form of the data on the pages was included to the greatest extent practical. The guide established a standard keyboard logic and standard display formats. The overall goal of these first two efforts was a design guidance package, just short of a specification, to create a more standard set of instructional capabilities and make the instructor's environment more effective. This goal has been achieved through the publication of surveys and guidelines. Work is underway to incorporate these guides into Military/Prime Specifications. (FY87)

CUSTOMER: ASD/YW

POINT OF CONTACT: Mr. Byron Pierce, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Effects of Chemical Warfare Defense (CWD) on Airbase Maintenance Operations. Systematic observations, data collection, and videotape measurement techniques were developed to assess the task performance of aircraft maintenance technicians wearing the chemical defense ensemble. These techniques were first tested at Shaw AFB, NC, then used for actual data collection at Hahn AB, Germany. At Hahn AB, data were collected on the performance of technicians wearing the ensemble while performing 26 representative maintenance tasks. These data were analyzed to assess the impact of the ensemble on performance. In addition, these data were used to identify: tasks that are difficult to perform; specialized techniques and "workarounds"; potential improvements to the ensemble; and potential equipment design modifications which could facilitate maintenance performed under both normal and chemical warfare conditions. A second data collection effort at Hahn AB was accomplished to evaluate techniques developed to overcome observed problems found during the first study. (FY87)

CUSTOMERS: ASD, MAJCOMs

POINT OF CONTACT: Capt E. Alan Deibel, AFHRL/LRC, (513) 255-2606, AUTOVON 785-2606

Mission Reliability Model (MIREM). The MIREM is a program to evaluate the reliability and sustained operating capability of advanced fault-tolerant electronic circuits during early development. MIREM provides engineers with a tool which can evaluate alternative avionics designs and identify improvements that can be made during the conceptual phase of development. MIREM is applicable to modular avionics systems that process many functions at once, require a minimum number of resources, and operate for extended periods of time without a critical failure. This is accomplished by incorporating fault tolerance--the ability to endure component failures without a loss in capability. MIREM assists the engineer by quantifying the fault tolerance in a circuit. Now that development of the MIREM software is complete, the model is being incorporated into MIL-STD 756B as a standard reliability prediction technique. (FY87)

CUSTOMERS: Integrated Communication Navigation and Identification Avionics Program Office, WPAFB, OH; Integrated Electronic Warfare System Program Office, WPAFB, OH; Ultra-Reliable Radar Program Office, WPAFB, OH; Sacramento Air Logistics Center, R&M Analysis Branch, McClellan AFB, CA; Rome Air Development Center, Reliability and Systems Engineering Branch, Griffiss AFB, NY; TRW, San Diego, CA; Westinghouse Corporation, Baltimore, MD; Pratt & Whitney, West Palm Beach, FL; MITRE Corporation.

POINT OF CONTACT: Ms. Wendy Campbell, AFHRL/LRL, (513) 255-8418, AUTOVON 785-8418

Guidelines for Range System Development. A series of experiments examined the effects of factors such as real-time and post-mission feedback on the effectiveness of electronic combat (EC) training systems. The basic findings from these experiments were: (a) Simple emitter systems which provide neither realistic, real-time feedback nor significant post-mission feedback cannot support effective countermeasures training; (b) providing accurate post-mission feedback can compensate to a great degree for lack of real-time interaction, but the lack of such interaction may affect the types and timing of countermeasures employed; (c) significant degradation in EC performance occurs over a 4- to 6-month period, with the amount of loss being affected by the level of prior proficiency and the amount of prior training; and (d) significant transfer of training from the flight simulator to the aircraft occurs, as evidenced by more frequent use of countermeasures on early exercise sorties and a reduction in judged attrition. These results provide some guidelines for the development of future range systems. In addition, they serve as a starting point for an investigation into the integration of a spectrum of training devices to produce an optimal EC training program. (FY88)

CUSTOMER: AD/YI

POINT OF CONTACT: Dr. Thomas Killion, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Precursor Computer-Aided Acquisition and Logistics Support (PCALS) Demonstration. Two prototype information software systems, developed under independent Air Force efforts, were integrated for a PCALS demonstration sponsored by the Office of the Secretary of Defense. One system, developed as a joint project between AFHRL and the Air Force Wright Aeronautical Laboratories (AFWAL) Flight Dynamics Laboratory, is the Integrated Design Support (IDS) System. IDS is an information system which manages weapon system technical data primarily in the engineering and logistics environments. The second system, developed in the AFWAL Materials Laboratory, is called the Integrated Information Support System (IISS). The IISS also manages weapon system technical data, but primarily in a manufacturing environment. Under a three-schema architecture, both systems employ a neutral view or conceptual schema to interface between the user's view of the data, or external schema, and the way the data are physically stored, or internal schema. Under the PCALS effort, the conceptual schemata from these two software systems were integrated to demonstrate that two independently developed information systems built using the three-schema architecture can be successfully integrated. The success of the integration effort was

demonstrated by posing live queries to the system within the framework of a realistic scenario. This effort provided a preliminary demonstration of the overall Computer-Aided Acquisition and Logistics Support (CALS) information transfer capability. (FY88)

CUSTOMERS: AFSC, OSD CALS Office

POINT OF CONTACT: Mr. Mark Hoffman, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Content Data Model (CDM). The CDM is an attempt to provide structure to the rapidly developing world of digital data bases and electronic information systems. A single cohesive model is used to describe all types of information that could be required to maintain any given vehicle. Important goals include: providing an interchange and validation structure for any information which may be passed between automatic systems that operate on different software or hardware; providing a generic model for any future information or vehicles which might be included in an electronic system; and allowing repetitive or shared data to be stored only once in any electronic storage system. The technology intent is to make the information independent of the implementation. The CDM is being coordinated with the DOD CALS Working Group, and is expected to become a CALS standard. (FY88)

CUSTOMERS: AFSC, DOD, Industry

POINT OF CONTACT: Mr. David Gunning, AFHRL/LRC, (513) 255-2606, AUTOVON 785-2606

Product Data Control Model (PDCM). Integrated Design Support (IDS) is an information systems R&D program which has as its primary objective improvement of the management of the technical data associated with major Air Force weapon systems. The PDCM is the IDS information model or conceptual schema and is the cornerstone upon which IDS is being built. The PDCM defines all the data entities and their logical interrelationships needed to provide weapon system engineering support. The PDCM provides the framework for data integration by defining how the enterprise-wide engineering, manufacturing, and operations support products relate from the viewpoint of critical data. Specifically, the PDCM serves as a bridge between the user and the hardware system, freeing the user from needing to know where or how the particular data one wishes to access are stored. The PDCM is unique to industry and has currently been acknowledged as one of the first models of its kind that allows one to capture, manage, maintain, and retrieve all the technical data pertaining to a product. This advanced data base management system technology representation has been highly acclaimed by the engineering community for its neutral and logical view, and is actively being studied for implementation within the Air Force Air Logistics Centers (ALCs), the National Aeronautics and Space Administration (NASA), the US Department of Transportation, and various aerospace organizations including Boeing, Martin-Marietta, General Dynamics, Rockwell, and Lockheed. It is also playing a significant role in national product data standards development. (FY88)

CUSTOMERS: ASD, Industry

POINT OF CONTACT: Mr. Mark Hoffman, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Authoring and Presentation System (APS). The APS was developed in support of the Integrated Maintenance Information System (IMIS), which will provide technicians with direct access to several maintenance information systems and data bases. A fundamental requirement for IMIS to succeed is the capability to author, find, merge, sort, update, and display graphics and technical information. APS provides the means to generate, store, organize, retrieve, and display electronic technical order information. The APS data base provides the flexibility required to represent the complex interrelated data found in technical orders. (FY88)

CUSTOMERS: ASD, Industry

POINT OF CONTACT: Mr. David Gunning, AFHRL/LRC, (513) 255-2606, AUTOVON 785-2606

Maintenance Diagnostic Aiding System (MDAS). An important function of the Integrated Maintenance Information System (IMIS) will be its ability to aid the maintenance technician in troubleshooting sophisticated weapon systems. The basis of MDAS is to provide a tool that closely models how equipment behaves under failure and offers the best diagnostic or repair activities to the technician during troubleshooting. MDAS rank-orders available tests by finding the test which subdivides the set of suspected faults such that the probability of failure for those faults being tested is approximately equal to the failure probability of those not tested. Probabilities are based on Mean Time To Failure. Test times are then considered so that tests requiring the shortest time are moved to the top of the list of recommended tests, all other things being equal. (FY88)

CUSTOMERS: ASD, Industry

POINT OF CONTACT: Mr. David Gunning, AFHRL/LRC, (513) 255-2606, AUTOVON 785-2606

Color Modeling Procedures. Analysis of color modeling procedures was conducted and identified several problems associated with current techniques. A corrective procedure was developed which involves the use of objective color matching employing the Swedish Natural Color System. The color codes are calibrated according to the characteristics of the intended display device. This procedure is currently being validated at the AFHRL Operations Training Division. The results are expected to be higher-fidelity color imagery and reduced development time. (FY88)

CUSTOMER: ASD

POINT OF CONTACT: Dr. Elizabeth Martin, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Advanced Visual Technology System (AVTS). The AVTS computer image generator (CIG) was designed to provide visual "out-the-window" and multisensor imagery for the full spectrum of tactical air missions. This includes air-to-surface weapons delivery, low-level flight, acquisition of surface-to-air missiles, evasive maneuvers, and normal flight operations such as takeoff, landing, and aerial refueling. The CIG hardware and software are compatible with different types of display systems and provide high-quality, realistic imagery for combat simulations. A data processing technique called "area processing" reduces the amount of computer hardware required and overcomes the technical limits of other CIG systems. This technology is being marketed by General Electric under the trade name of Compuscene IV. Another product from this AVTS effort is a high-resolution, limited-field-of-view dome visual display originally developed for evaluation

of Army helicopter nap-of-the-earth training effectiveness. The helicopter cockpit has now been replaced with an F-16A cockpit to be used in high-speed, low-altitude flight training effectiveness and air-to-air and air-to-ground combat studies. The AVTS also provides imagery to an A-10 tactical research simulator and a visual imagery testbed facility. (FY88)

CUSTOMER: ASD

POINT OF CONTACT: Mr. Steve Stephens, AFHRL/OTA, (602) 988-6561, AUTOVON 474-6561

Dedicated Visual Imagery Research Facility. This facility consists of several displays including light valve projectors, rear-screen and and small dome systems, and computer graphics image generation systems. The Laboratory facility supports behavioral R&D in visual perception and simulation imagery. (FY88)

CUSTOMERS: ASD - use R&D results; AFHRL - to enhance technology base

POINT OF CONTACT: Dr. Elizabeth Martin, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Data Base Requirements for Simulating High-Resolution Radar. Three experiments were conducted to determine minimum data base density requirements for simulating Synthetic Aperture Radar (SAR). Experiments were conducted using SAR operator ratings of different simulations, analysis of radar scope interpretation cues, and SAR task performance. It was determined that SAR task-critical features are present in Defense Mapping Agency (DMA) Level 2 Digital Feature Analysis Data (DFAD) but that simulations must be enhanced with generic information about high-density areas. (FY88)

CUSTOMERS: ASD/ENETV, ASD/YWB, DMAAC/PR, SAC/DOT, SAC/XP

POINT OF CONTACT: Dr. Peter Crane, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Image Update Rate and Display Rate. The effects of image update rate and display rate on small object perception were investigated. A small object was modeled to move in a path perpendicular to the viewpoint. Three object speeds were used. Image update rate was either 30Hz or 60Hz. Display rate was either 60Hz interlaced or 60Hz noninterlaced. The subjects' tasks were to identify the shapes of the objects. The results indicated systematic differences in perception as a function of the display variables. (FY88)

CUSTOMER: ASD/YW

POINT OF CONTACT: Dr. Elizabeth Martin, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Design Analysis Models (CREW CHIEF). CREW CHIEF is a computer-based anthropometric computer graphics design and analysis tool (and supporting data base) that models Air Force technicians for use in performing mockup-type computer-aided evaluations of new weapon systems and equipment designs. Human-like characteristics such as standing, sitting, squatting, crawling, lifting, pulling, and tool usage are featured in the model. This model encompasses both male and female technicians and maintenance work in both standard work clothes and protective equipment. The model can evaluate a proposed design in maintainability terms such as accessibility of equipment, tool usage within access areas, maintenance operations and task requirements, and load lifting

requirements. It can be used by designers to do on-line analysis during early stages of the design cycle. A beta test version of the model has been released to industry. (FY88)

CUSTOMERS: ASD, AFALC, Industry; NASA has expressed interest in these tools for use in analysis of space operations

POINT OF CONTACT: Ms. Jill Easterly, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Integrated Electronic Warfare System (INEWS). The INEWS is the electronic warfare component which will be used on the Advanced Tactical Fighter (ATF) and the Advanced Tactical Aircraft (ATA). Because of its importance to the mission of these aircraft, additional funds were provided to the INEWS system program office (SPO) to reduce the risk associated with supporting the system. As part of the Supportability Risk Reduction Program, the SPO initiated the INEWS Reliability, Availability, and Maintainability in Computer-Aided Design (RAMCAD) effort. The goal of this effort was to use RAMCAD technology to improve the initial design of the INEWS. AFHRL personnel helped to write a portion of the INEWS Request for Proposals (RFP) and participated in the source selection. The objectives of the effort were to provide real-time supportability feedback, shorten design time, and sensitize the designers to design impacts of reliability, maintainability, and testability. The INEWS program was the first major DOD program to use RAMCAD as part of the source selection process to apply to initial design. Demonstrations of the INEWS - RAMCAD capability are being conducted at the close of the Demonstration/Validation phase. (FY88)

CUSTOMER: INEWS SPO

POINT OF CONTACT: Capt Don Loudermilk, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Model Aircrew Training System (MATS). The MATS program was undertaken in response to a USAF Scientific Advisory Board mandate to make C-130 aircrew training more efficient so that mission-critical resources can be devoted to raising combat skill levels. The MATS documentation provides: (a) a detailed review and analysis of C-130 mission and task requirements; (b) a review of state-of-the-art training technology and system evaluation techniques; (c) a review of current C-130 training resources and practices; and (d) a description of the system architecture for a mission-oriented, proficiency-based training system. Specific recommendations are provided for implementation of a new integrated approach to training for the C-130 which is individualized and self-paced and utilizes concepts from modern learning theory. A computer-based subsystem is also recommended for the delivery and management of instruction, as well as the allocation and scheduling of all training resources, including the aircraft. The findings and recommendations from the MATS effort have been utilized by the Training Systems Program Office of the Aeronautical Systems Division in the development of the RFP for the C-130 Aircrew Training System (ATS). They have also been used by MAC Headquarters as a basis in planning for the implementation, test, and evaluation of the new C-130 ATS and have been provided to all bidders on the C-130 ATS RFP for guidance. In addition, the findings and lessons from this effort have been applied to a number of other programs including the C-5 and C-17. (FY86)

CUSTOMERS: MAC, ASD

POINT OF CONTACT: Dr. Robert Nullmeyer, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

C-130 Visual Requirements. Two studies were conducted concerning field-of-view (FOV) requirements for C-130 weapon system trainers at Little Rock AFB, AR. The first study investigated the effects of eliminating peripheral visual information on assault landings using experienced C-130 pilots. The results indicated no adverse effects for this task. The second study investigated the effects of eliminating peripheral visual information on low-level navigation and airdrop maneuvers. Pilot eye position was also monitored. The results indicated that pilots could still perform the task without the peripheral windows but that they adopted a different visual behavior pattern in order to do so. A third study, which involved scene content, investigated the effects of enhanced detail (texture patterns and vertical development) on performance of assault landings. The results indicated enhanced performance in the high-detail scene condition. (FY88)

CUSTOMERS: MAC, ASD

POINT OF CONTACT: Dr. Elizabeth Martin, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

TACTICAL AIR COMMAND

Proof-of-Principle Training Study (Human Tutor). An empirical study was successfully conducted with F-15 integrated avionics technicians at Nellis AFB, NV to address the trainability of cognitive job skills such as troubleshooting. Tutoring (by a human) had a highly significant effect on troubleshooting performance. (FY87)

CUSTOMERS: HQ TAC/LGQ, HQ AFCC/LGM, ATC Tech Training Centers, USAFOMC

POINT OF CONTACT: Dr. Robert Pokorny, AFHRL/MOMJ, (512) 536-3551, AUTOVON 240-3551

Cognitive Task Analysis Technology. This technology involved the development of step-by-step procedures for conducting workshops with Air Force technical experts to capture the knowledge they use and the reasoning processes they use in troubleshooting equipment faults. Results provide input to training systems and the basis for extracting cognitive job skills that are common to high-technologies specialties. Additional procedures were incorporated to represent more completely the equipment-related (device) and strategic knowledge used in troubleshooting. This technology was successfully used in a knowledge engineering workshop with experts. (FY87)

CUSTOMERS: HQ TAC/LGQ, HQ AFCC/LGM, ATC Tech Training Centers, USAFOMC

POINT OF CONTACT: Dr. Sherrie Gott, AFHRL/MOMJ, (512) 536-3942, AUTOVON 240-3942

Field of View (FOV) for Manual Bomb Delivery. Two studies investigated the effects of various instantaneous head-slaved fields of view on the acquisition of manual dive bombing skills. One study employed the F-16 Fiber-Optic Helmet-Mounted Display (FOHMD); the other study employed the A-10 Dodecahedron simulator. The results indicated that limited FOV adversely affects performance. (FY87)

CUSTOMERS: TAC, ASD

POINT OF CONTACT: Lt Kevin Dixon, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Air Combat Maneuvering (ACM) Performance Measurement System (PMS). An ACM PMS has been developed that will be used to conduct R&D aimed at providing Tactical Air Command with valid measures of aircrew performance necessary for evaluating the effectiveness of present and future air-to-air combat training devices. The ACM PMS is a performance data collection and analysis system that will be implemented on the Simulator for Air-to-Air Combat (SAAC) and the Air Combat Maneuvering Instrumentation (ACMI) range at Luke AFB, AZ. The ACM PMS will continue to support R&D on: (a) measurement development, validation, and refinement; (b) the use of computer graphics to support post-mission debriefing; (c) training effectiveness of the SAAC and the ACMI; (d) simulator visual requirements; and (e) fighter-attack-reconnaissance pilot selection criteria for dual-track training programs. (FY87)

CUSTOMER: TAC

POINT OF CONTACT: Lt Kevin Dixon, AFHRL/OTE, (602) 988-6561, AUTOVON 474-6561

Basic Electronic Combat Part-Task Trainer (ECPTT). The purpose of the ECPTT is to provide training on electronic combat (EC) systems (i.e., radar warning receiver (RWR), expendables (chaff/flares), and electronic countermeasures (ECM) systems), threats, and basic tactics to TAC pilots for a variety of aircraft (e.g., A-10, F-16). Current training in these areas consists of some academics and book study, limited familiarization training in the flight simulator, and infrequent in-flight practice at EC ranges. The basic ECPTT consists of training at three levels. The first level provides system familiarization and allows practice in system operation. Level two addresses threat information, providing a consolidated, interactive "catalog" of information on threat capabilities, parameters, operations, and appropriate tactics. Level three is a gaming mode, which allows the pilot to "fly" through a variety of tactical scenarios. The pilot receives appropriate RWR cues and is able to employ expendables, ECM, and maneuvering to avoid/defeat threats. The device's displays and controls are driven via a microprocessor-based simulation, which will also generate tactical scenarios and associated cues and provide feedback on pilot actions. (FY87)

CUSTOMER: TAC

POINT OF CONTACT: Mr. Gary Boyle, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Threat System Relative Lethality Values. The Air Staff and HQ TAC requested statistical support in the development of threat system relative lethality values for a Tactical Air Forces Mission Planning System (TAF MPS). TAF MPS is an automated system that will integrate weapons delivery, flight planning, and penetration analysis to select preferred routes through a battlefield. The amount of time available for flight planning is becoming shorter as targets become more mobile. The TAF MPS algorithm is designed to emulate the expert flight planner, with a much shorter response time. Air Force-wide agreed-upon relative lethality values for certain surface-to-air missiles and radar-directed guns as a function of range and altitude do not exist. To identify these values, AFHRL provided consultative support in the development, administration, and analysis of a survey which captured the policies of experienced personnel in rating the relative effectiveness of certain ground-to-air weapon systems. The sample of expert raters was comprised of 44 pilots, navigators, electronic warfare officers, and nonrated personnel from various intelligence and operational organizations. AFHRL performed interrater reliability analysis to determine the degree of interrater agreement. AFHRL then computed descriptive statistics and performed curve fitting analyses to describe relative lethality as a function of range for each altitude/threat system combination. This R&D project provides TAC with the threat system relative lethality data necessary to make the TAF MPS operational. (FY88)

CUSTOMER: TAC

POINT OF CONTACT: Mr. Walter Albert, AFHRL/MODM, (512) 536-3677, AUTOVON 240-3677

Computer-Based Instruction/Simulator Program for Fighter Lead-In Training Feasibility Research. This effort investigated the training opportunities that might be afforded through advances in flight simulation and computer-based instruction (CBI) to enhance the Fighter Lead-In Training (LIT) program at Holloman AFB, NM. The investigation provided an assessment of the LIT program, identifying those areas that could be improved by CBI and simulation. Alternative mixes of CBI and simulation systems were evaluated for their marginal benefit to the LIT program, and the alternatives were compared using a cost-benefit analysis. (FY88)

CUSTOMER: TAC

POINT OF CONTACT: Mr. Byron Pierce, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Airborne Measurement Concepts (AMC) Program. All major program tasks were reviewed including: mission analysis, information requirements analysis, data requirements, and airborne and ground-based processing requirements. A functional specification for a mission reconstruction and debriefing system based on airborne data recorders was developed based on these analyses. (FY88)

CUSTOMER: TAC

POINT OF CONTACT: Maj Ronald Grattopp, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Computer-Based Training for a Common High-Tech Job Skill (Logic Circuitry Tracing). Software was completed and pilot-tested for a logic circuitry trainer (Zenith-248 microcomputer). The test was accomplished using 12 technicians in three different avionics specialties. Test results and user response were very good. (FY88)

CUSTOMERS: HQ TAC/LGQ, HQ AFCC/LGM, ATC Technical Training Centers, USAFOMC

POINT OF CONTACT: Dr. Sherrie Gott, AFHRL/MOMJ, (512) 536-3942, AUTOVON 240-3942

Prototype (Demo) Job Tutor. This effort resulted in a successful field test of an intelligent tutoring system for F-15 avionics troubleshooting. Results support claims that a cognitive theory-based training system is effective in teaching complex cognitive skills (i.e., troubleshooting), that experience can be accelerated (20 hours of training boosted experience levels by as much as 3.5 years), and that a computer-based instructional approach is effective. (FY88)

CUSTOMERS: HQ TAC/LGQ, HQ AFCC/LGM, ATC Technical Training Centers, USAFOMC

POINT OF CONTACT: Dr. Sherrie Gott, AFHRL/MOMJ, (512) 536-3942, AUTOVON 240-3942

Tutor Development Technology. This effort resulted in step-by-step procedures for developing a tutor such as the Demo Job Tutor. Procedures cover transforming the output of cognitive task analysis into a design for instruction and curriculum content, including software development procedures. (FY88)

CUSTOMERS: HQ TAC/LGQ, HQ AFCC/LGM, ATC Technical Training Centers, USAFOMC

POINT OF CONTACT: Dr. Sherrie Gott, AFHRL/MOMJ, (512) 536-3942, AUTOVON 240-3942

AIR NATIONAL GUARD

Low-Altitude Awareness Trainer. This effort produced a part-task training system that uses an interactive videodisc containing aerial views and graphics to teach pilots to recognize low-altitude visual phenomena. The videodisc can be utilized in either a classroom or self-paced instruction environment to teach the visual aspects of low-altitude flight. Interactive videodiscs have the capacity for 30 minutes of programming per side. A computer program encoded digitally on the disc makes interaction with the student possible. Menus prompt the student to select various subjects. Picture stops, still frames, and motion sequences are arranged on the disc in a manner that correlates with the overall instructional design. This interactive videodisc technology application is strictly an experimental product for field evaluation. In the project's current phase, the trainer will be used as a classroom aid only. The overall objective of this effort was to determine the extent to which microcomputer technology can address a variety of cognitive task elements for training programs. (FY86)

CUSTOMERS: Air National Guard, TAC

POINT OF CONTACT: Dr. Bernell Edwards, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Air Combat Expert Simulation (ACES). ACES simulates decision making by expert fighter pilots in air-to-air combat. The actual program is on disk and runs on an IBM-PC with expanded memory. The ACES model is a desktop training system that engages the student in a series of mock combat situations, allowing the student pilots to learn about conditions that call for particular maneuvers. The ACES model predicts the selection of an air combat maneuver given the scenario of 1 vs 1 engagement. Selection rules are incorporated to determine which basic fighter maneuver to execute, given a description of an airspace with two competing T-38 aircraft. The aircraft are displayed in three-dimensional graphics. Maneuvers may be selected for either aircraft by either a user or ACES. The selection of maneuvers by ACES compares favorably with selections made by expert fighter pilots. Future developments include expanding from T-38 only to F-15 and F-16 domains, enhancing the three-dimensional graphics, and increasing from a classical maneuver to a tactical mode (from one move at a time to one, two, or three moves at a time). (FY87)

CUSTOMER: Air National Guard

POINT OF CONTACT: Dr. Thomas Gray, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

Air Intercept Trainer. The air intercept trainer, a microcomputer-based trainer, simulates F-16 flight dynamics, the radar scope, the radar control panel, the heads-up display (HUD), a throttle and fixed sidestick, and an instructor-operator station--all in a movable cabinet. The training objectives of this device are to help pilots acquire skills in the use and interpretation of the F-16 radar and HUD, and to enable pilots to develop air intercept skills. (FY87)

CUSTOMERS: Air National Guard, TAC/DOT, AFRES/REXP

POINT OF CONTACT: Dr. Bernell Edwards, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

NAVY/ARMY/JOINT SERVICES

Women Vietnam Veteran Cohort Sample. A study was completed to assemble a non-Vietnam, female veteran comparison group that closely matched 771 Air Force females who served in Vietnam during 1966 to 1973. The comparison group, which consisted of 1,040 cases, was requested for use in a Veterans Administration health effects study for female veterans of the Vietnam War. (FY86)

CUSTOMERS: US Army and Joint Services Environmental Support Group (DAAG-ESG-J)

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

Data Collection and Presentation System (DCAPS). The DCAPS is a prototype automated data collection tool that allows the field user to capture such data as organizational structure, reporting channels and interactions among organizational elements. It can be used during the development of new jobs and to identify training needs. This is a new application. The DCAPS was transitioned to the Joint Warfare Center during the 4th Quarter of FY88 for an internal field evaluation. (FY87)

CUSTOMER: Joint Warfare Center

POINT OF CONTACT: Mr. Jeffery Wampler, AFHRL/LRG, (513) 255-8502, AUTOVON 785-8502

Knowledge Acquisition/Intelligent Authoring Aids. This is a joint-Service initiative to design and develop intelligent computer-assisted instructional tools and techniques for system users (instructors and students). Now in the third year of its 4 years, this R&D effort is designed to assist each of the three Services (Air Force, Navy, and Army) to more efficiently train their members on a wide variety of tasks. Probable training domains include space operations and space vehicle maintenance. In the past year, symbolic and natural language interfaces have been developed. These features allow instructors to develop materials which are used by the system as it delivers intelligent, automated instruction. (FY88)

CUSTOMERS: NTSC, ARI, AFHRL

POINT OF CONTACT: Dr. Kurt Steuck, AFHRL/IDI, (512) 536-2981, AUTOVON 240-2981

Learning Abilities Measurement Program (LAMP) Automated Testing System (LATS). The LATS is a software tool for the development of computer-administered experimental cognitive tests. LATS is written in Turbo Pascal and is implemented on the Zenith-248 microcomputer. LATS enables a psychologist to develop automated cognitive tests for the assessment of information processing abilities (processing speed, attention, memory, perception) and various cognitive skills. LATS tests are fully automated with respect to instructions, administration, data collection, and data reduction. At the heart of LATS is a "driver" program which understands a custom-made, high-level programming language. Because this language can describe complex sequences of stimulus presentation and stimulus contingencies, a wide variety of cognitive tests can be and have been implemented. LATS will continue to evolve as the needs of LAMP stretch the limits of the system. (FY88)

CUSTOMERS: Navy - NPRDC; AFHRL - to enhance technology base

POINT OF CONTACT: Dr. William C. Tirre, AFHRL/MOEL, (512) 536-3570, AUTOVON 240-3570

OTHER CUSTOMERS

Software Technology Transfer. The Information Sciences Division (AFHRL/SC) has maintained active participation in the technology transfer program through the distribution of the following software packages:

The new Comprehensive Occupational Data Analysis Programs (ASCII CODAP) to the Texas Department of Human Services (TDHS), the US Army Soldier Support Center (SSC-NCR), the University of Maryland, and the Australian Department of Defense.

The Hierarchical Grouping of Regression Equations (HIER-GRP) to the University of Pittsburgh, the Nuclear Regulatory Commission, the Virginia Polytechnic Institute and State University, and the Ohio University.

The Automatic Interaction Detector (AID-4) to the Pennsylvania Department of Health.

The general prupose program libraries to the Texas State Treasury, the Texas Department of Human Services, and the Defense Mapping Agency.

The Author System for Education and Training (ASET) courseware library to the National Aeronautics and Space Administration (NASA) Slidell Computer Complex.

The Item Analysis Program (IAP) to the Naval Education and Training Center.

The Policy Specification (POLSPEC) program and the Payoff Generation (PAYGEN) program, as well as HIER-GRP and AID-4, to the University of Texas at Austin.

The Equipercential Text Equating (EQUATE) program to the Army Research Institute. (FY86-continuing)

CUSTOMERS: As noted above

POINT OF CONTACT: Mr. Dick Rogers, AFHRL/SCY, (512) 536-3928, AUTOVON 240-3928

Electronic Security Command Computer Support. Optical scanning and data processing for personnel surveys and special testing were performed in support of the Electronic Security Command (ESC) COMFY Olympics. This program is used to select and recognize the top three ESC performers in each of 18 enlisted career fields. This support is provided annually. (FY86-continuing)

CUSTOMER: HQ ESC/DOT

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

Enlisted Promotion Rates for the Air Force Intelligence Service. AFHRL/SC used its R&D data base to determine enlisted promotion rates for personnel in the Air Force Intelligence Service. The information was provided for all grades, E-5 through E-9, by promotion cycle across noncritical Air Force specialties. (FY87)

CUSTOMER: AFIS/DPR

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

AFSPACECOM Requirements Study. AFHRL teamed with AFSPACECOM to identify potential user command research requirements in the areas of human performance and training. A survey strategy was employed involving AFSPACECOM operations personnel. (FY87)

CUSTOMER: HQ AFSPACECOM/DOT

POINT OF CONTACT: Lt Michael Lawless, AFHRL/LRG, (513) 255-8340, AUTOVON 785-8340

Flying Performance of Academy Graduates. Computer data files and statistical summaries were provided to the United States Air Force Academy (USAFA) containing FY77 through FY86 undergraduate pilot and navigator training data for USAFA graduates. The data supported a Graduate Evaluation Program study. (FY87)

CUSTOMER: USAFA/RR

POINT OF CONTACT: Ms. Doris Black, AFHRL/SCA, (512) 536-3921, AUTOVON 240-3921

Air Traffic Controller Study. The purpose of this effort was to examine new and existing selection procedures for entry into the Air Traffic Control Operator School. From this study, it was recommended to the Air Force Communications Command that the Armed Services Vocational Aptitude Battery (ASVAB) Administrative Aptitude Index (AI) be deleted as a selection requirement and that the General AI continue to be used. (FY88)

CUSTOMER: AFCC

POINT OF CONTACT: Dr. Linda Curran, AFHRL/MOAE, (512) 536-3256, AUTOVON 240-3256

Methodology for Generating Efficiency and Effectiveness Measures (MGEEM). The MGEEM is a multi-step productivity measurement and enhancement procedure which brings the managers and workers of an organization to consensus about the principal intended accomplishments of the organization called Key Result Areas (KRAs), and means of measuring each KRA, called indicators. Once the indicators are developed, MGEEM then graphically links them to levels of effectiveness on contingency charts. Multiple indicators and units can be aggregated upward to derive higher-level organizational productivity measures. Data to support the indicators come from the existing management information and reporting systems. Feedback to employees and supervisors, along with goal setting and incentives, can improve the level of unit productivity. The MGEEM is being transitioned to the Air Force Management Engineering Agency (AFMEA) to support implementation of AFR 25-5, Air Force Management Engineering Program. (FY88)

CUSTOMERS: AFMEA, ESC, AFOSP, AFLC, Navy

POINT OF CONTACT: Lt Michael J. Zimmerman, AFHRL/MOMD, (512) 536-3942, AUTOVON 240-3942

Microcomputer Intelligence for Technical Training (MITT I/II). An Intelligent Tutoring System (ITS) was developed to train Air Force and civilian flight controllers at NASA to diagnose and repair malfunctions of the space shuttle fuel cell system. Knowledge engineering techniques were used to elicit the domain knowledge necessary to build a complete training system, as well as the necessary pedagogical approach for presenting the domain knowledge. Most significantly, this project demonstrates the capability to design and implement robust, intelligent training systems within a microcomputer environment. Previous ITSs have been built on expensive, special-purpose computer hardware. This effort delivered prototype ITS software packages executable on the AT&T 6300 or the Zenith-248. The effort also provided operating instructions, student handbooks, source code, and written documentation supporting the sequence of steps integrated into the building of the system. (FY88)

CUSTOMER: NASA/JSC

POINT OF CONTACT: Capt Kevin Kline, AFHRL/IDI, (512) 536-2981, AUTOVON 240-2981

Unified Data Base (UDB) for Acquisition Logistics. The UDB is a Logistics Support Analysis Record (LSAR) data base system designed to improve the documentation and accessibility of acquisition logistics support data. UDB provides a data information and decision support system which enables logisticians and engineers to rapidly and efficiently document, retrieve, and query a central data base online via a computer terminal. UDB conforms to MIL-STD-1388-2A and automates all the data elements of this standard, through the addition of data elements supplemental to the military standard. The system may also be used to automate common acquisition data items. The UDB has been transitioned to the Air Force Acquisition Logistics Center (AFALC). (FY88)

CUSTOMERS: AFALC, Navy

POINT OF CONTACT: Mr. John Ianni, AFHRL/LRA, (513) 255-4086, AUTOVON 785-4086

Instructional Support System (ISS). ISS is a computer-based training (CBT) tool for development, delivery, and management of computerized instruction. It operates on the Digital Equipment Corporation (DEC) VAX family of computers, ranging from a MicroVAX II to an 8600 under the VMS operating system and the Zenith-248 under the MS-DOS operating system. ISS was developed as an Ada research project to port a mainframe-based, hardware-dependent CBT system to a minicomputer and achieve hardware independence. It was rehosted (2nd Quarter of FY88) to the Zenith-248 to provide Air Force and DOD users a powerful, standardized, low-cost, Government-owned training system. Recent additions to ISS include videodisc; microcomputer computer-managed instruction (CMI); enhanced system documentation; and stand-alone, exportable CAI and CMI training materials. (FY88)

CUSTOMERS: SAC, AFIT, AFLC, HSD, ESD, NASA, AFSC, ASD, Army, Navy

POINT OF CONTACT: Ms. Barbara Eaton, AFHRL/IDC, (512) 536-3992, AUTOVON 240-3992

AIR FORCE HUMAN RESOURCES LABORATORY

Systems Analysis of Control and Reporting Center Operations. AFHRL studied the processes used by Air Force Control and Reporting Centers (CRCs) and the potential impacts that new automation and distributed command, control, and communications (C^3) operational concepts could have on operator and system performance. This background study laid the foundation for current and planned research with the Modular Control Equipment (MCE). The highly automated MCE will replace the existing equipment in the air defense CRCs in the 1990s. AFHRL technology could help MCE personnel to identify the required personnel skills, training requirements, and design modifications for this new system. (FY86)

CUSTOMER: AFHRL - to enhance technology base

POINT OF CONTACT: Capt Gene Henry, AFHRL/LRG, (513) 255-9942, AUTOVON 785-9942

Training/Job Requirements System (TJRS). TJRS is a preliminary methodology which uses operational maintenance data to define operator performance and training standards. This system also provides the conceptual mechanisms for dynamically linking maintenance data to the Air Force occupational survey and Specialty Training Standard processes, thereby enhancing their validity and reliability. Specifically, TJRS can: (a) generate reports describing all maintenance tasks performed by individuals over a specified time period; (b) form the basis of aircraft-specific job description reports for each maintenance AFS on a work-center level, base level, or Air Force-wide; and (c) identify maintenance "troublespots" where more training is required. This exploratory development work has been used in the development of the Advanced On-the-job Training System (AOTS). (FY86)

CUSTOMER: AFHRL - exploratory development work

POINT OF CONTACT: Maj Jack Blackhurst, AFHRL/ID/OL-AK, (512) 479-2669, AUTOVON 685-2669

First-Generation Decision Support System (DSS). The first version of the DSS is implemented on commercial data base management software. Future expansions will use specialized expert system software. The first-generation DSS asks the user to specify task components and component order. It uses this information, information about component interdependence and skill type, and the reasons a component is difficult to learn or perform to make recommendations about partitioning tasks for training. The results of this effort provide guidelines to partition complex flight tasks that are trained in actual equipment and simulators into parts that can be effectively trained on less expensive systems. This part-task training DSS was a first attempt to determine what an enhanced DSS for part-task training could encompass. A 3-year effort designed to enhance the DSS has been proposed. A fully developed DSS that includes the proposed enhancements would have potential applications to the entire training community. (FY87)

CUSTOMERS: AFHRL; enhanced DDS - SAC, TAC, MAC, ATC

POINT OF CONTACT: Mr. Gary Boyle, AFHRL/OTU, (602) 988-6561, AUTOVON 474-6561

APPENDIX A: AFHRL CUSTOMER INDEX
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